

VACUUM CHAMBER ASSEMBLY

BACKGROUND OF THE INVENTION



This invention relates to a vacuum chamber assembly constituting a part
5 of a device such as a sputtering device, a dry-etching device, a CVD device, a
vacuum furnace, etc., ~~in manufacture such as semiconductor used in~~
~~manufacturing such as semiconductor manufacturing, flat-panel manufacturing~~
~~manufacturing, and so on.~~

JP11-50229A discloses a vacuum chamber which can be used in a
10 semiconductor manufacturing system, in which a time for evacuating air after
changing consumption articles or after regular maintenance can be decreased.

In ~~thus-the~~ vacuum chamber, joint portions are joined by means of
welding, soldering, etc, deformation due to the joint work are removed, and
further, a cutting operation or a grinding operation is carried out in order to
15 increase an airtight level. Furthermore, it is necessary to carry out a cleaning
operation in order to remove contaminations such as swarf, flux, etc. coming
out of the cutting operation or the grinding operation.

Besides, as shown in JP-11-50229A, the vacuum chamber constitutes a
part of ~~the-a~~ device such as a sputtering device, a dry-etching device, a CVD
20 device, or a vacuum furnace. However, up to now, a method, in which the
device including the vacuum chamber is assembled in a factory, and then
transported and arranged to a specific place, was carried out in order to maintain
an airtight level of the vacuum chamber.

However, since the vacuum chamber becomes larger as the device
25 becomes larger, it becomes difficult to transport and arrange the device after
assembling it in the factory, so that ~~necessity such as~~ it becomes necessary, for

example, to assemble the device ~~on a working spot at a worksite~~ such as a factory ~~directly~~ is yielded. As a result, though it is desired to assemble the vacuum chamber on the spot, it is difficult to repair the deformation ~~coming out of~~ due to the work in a case that in which the vacuum chamber is assembled by means of welding or soldering on the spot, so that ~~any troubles problems~~ are yielded ~~caused~~ in the airtight level of the vacuum chamber, and a problem such that ~~an operation for also~~ cleaning of contaminations such as swarf, flux, etc. is very difficult is yielded. In the case of desiring extension, the extension must be given up because it is difficult to carry the device into the spot.

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SUMMARY OF THE INVENTION

The object of the invention is to provide a vacuum chamber assembly which can be assembled on a spot such as a factory easily and extension of which is easy.

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This invention is a vacuum chamber assembly which constitutes a part of a device such as a sputtering device, comprising at least a floor plate, an upper plate, a plurality of props standing on ~~said the~~ floor plate to support ~~said~~ the upper plate, and side plates for closing side opening portions between ~~said~~ props, characterized by that: first ~~the~~ props. First connected portions between the floor plate and the props and second connected portions between the upper plate and the props are fixed by screw fixing means; side members. Side surfaces of the floor plate, the props and the upper plate which constitutes circumferential edge portions of the side opening portions are provided with installation grooves respectively; a grooves, respectively. A gasket which is unitedly constituted of side surface sealing portions ~~which is~~ installed in the installation grooves formed on the circumferential edge portions of the side

opening portions, respectively, and connection sealing portions for sealing the first connected portions and the second connected portions is provided; and the The side plates are fixed to the circumferential edge portions so as to close the side opening portions via the side surface sealing portions of the gasket,
5 respectively.

Furthermore, it is preferred that projections projecting along borderlines of the first connected portions and the second connected portions are formed, respectively, and sealing grooves for engaging the projections are formed in the connection sealing portions of the gasket, respectively.

10 Moreover, it is preferred that housing spaces, for housing top portions of the gasket which is pressed by the side plates, are formed along side lines of the installation grooves in the installation grooves, respectively. It is better that the The housing spaces are can be formed along one of the side lines of the installation grooves or along both side lines of the installation grooves.

15 Furthermore, it is desired that the first connected portions and the second connected portions have housing grooves for the connection sealing portions of the gasket which are formed in an arc shape along respective connected portions, and the projections are formed so as to project into the housing grooves. Besides, it is desired that the housing grooves are formed in a
20 size such as to be able to house top portions of the connection sealing portions of the gasket which are pressed and deformed by the side plates.

Moreover, the side plates have are provided with at least equipment for windows, equipment for intake or discharge piping for intake or discharge, wiring harness equipment for wiring harness, etc.

Fig. 1 is an explanatory diagram of a framework of a vacuum chamber assembly according to a working mode of the present invention;

Fig. 2 is an explanatory diagram showing a condition in which a gasket is installed to the framework of the vacuum chamber assembly according to a 5 working mode of the present invention;

Fig. 3 is an explanatory diagram showing a condition in which the vacuum chamber assembly according to the work-working mode of the present invention is completed; |

Fig. 4 is a partial enlarged explanatory diagram of a connected portion 10 which is between a floor plate and one of props or between one of props and an upper plate;

Fig. 5 is a partial enlarged plan view of the connected portion;

Fig. 6 is a partial cross section of the prop;

Fig. 7 is a partial cross section of a side sealing portion of the gasket and 15 an installation groove;

Fig. 8 is a partial cross section of a connection sealing portion of the gasket and a connected portion;

Fig. 9 is a partial cross section of another working mode of a side sealing portion of the gasket and an installation groove; and

20 Fig. 10 is an explanatory diagram showing a condition in which the vacuum chamber assemblies are provided in series.

THE PREFERRED EMBODIMENT OF THE INVENTION |

Hereinafter, a working mode of this invention is explained by referring 25 to the drawings. |

A vacuum chamber assembly 1 according to the present invention

constitutes a part of a device such as a sputtering device, dry-etching device, a CVD device, a vacuum furnace, etc. for instance, a sputtering mechanism comprising a substrate, a target, etc., is located inside thereof, and a pump for vacuuming, a control unit, etc., are provided outside thereof, so that a sputtering
5 device is constituted as a whole (not shown in drawings).

Firstly, in ~~this~~the vacuum chamber assembly 1, as shown in Fig. 1, a framework 9 is constituted of a floor plate 2 on which the device is installed, a plurality of (four in this working mode) props 3 standing on the floor plate 2 and an upper plate 4 supported by the props 4 so as to surround a space 50 in
10 which the device is located.

It is desired that assembling the framework 9, as shown in Fig. 4, is carried out by ~~that~~projecting portions 31 formed at ends of props 3 ~~are~~being engaged into concave portions formed in the upper plate 4, respectively, and the props 3 and the upper plate 4 ~~are~~being fixed together by a fixing means such as
15 bolts and screws 20. Also, connection between the floor plate 2 and props 3 are fixed ~~by~~in the same way.

Besides, as shown in Fig. 1, an installation portion 7 in which a gasket 8 is installed is formed on the framework 9. This installation portion 7 is constituted of installation grooves 71 that are formed on side surfaces of the
20 floor plate 2, the props 3 and the upper plate 4 which constitute circumferential edges of openings 5 formed between props 3 respectively, and arc-shaped housing grooves 10 formed along borderlines of connected portions 12 which
are ~~consisted~~consist of first connected portions between the floor plates 2 and the props 3 and second connected portions between the props 3 and the upper
25 plate 4, respectively, wherein the installation grooves are connected via the housing grooves 10, respectively.

Then, as shown in Fig. 2, the gasket 8 is installed in the installation portion 7. The gasket 8 is unitedly constituted of side surface sealing portions 81 which are installed into the installation grooves 71 formed in the circumferential edges of the side opening portions 5, respectively, and 5 connection sealing portions 82 fitting into the connected portions respectively as shown in Fig. 6.

As shown in Fig. 3, the vacuum chamber assembly 1 is assembled by fixing the side plates 6 for closing the side opening portions 5 to the framework 8-9 in which the gasket 8 is installed so as to press the gasket 8.

10 Besides, a peephole 30 as shown in Fig. 3 is formed in the side plate 6, and further, a piping mechanism for intake and discharge and a wiring harness mechanism ~~for wiring harness~~ between a control unit and a sputtering device located inside thereof are provided (not shown in Figures).

Furthermore, the respective side surface sealing portions 81 of the 15 gasket 8 ~~is are~~, as shown in Fig. 7, an approximate square in their cross section so as to engage ~~to in~~ the installation grooves 71, so that top portions of it are deformed when the side plates 6 press them to crush into housing spaces 73 along side lines of the installation grooves. Thus, contacting faces between the top portions of the side surface sealing portions 81 and the side plates 6, 20 respectively, are increased, so that a sealing level of these portions can be increased.

Moreover, as shown in Figs. 4 and 8, parts of the housing grooves 10 in the connected portions 12 are provided with projections 11 projecting along contacted surfaces, respectively, and further the connection sealing portions 82 25 are provided so as to cover the projections 11 respectively. Concretely, housing concave portions 83 for housing the projections 11 are formed inside

the connection sealing portions 82, so that the sealing level in these portions can be increased because the projections 11 are engaged into-in the housing concave portions 83.

5 Besides, as shown in Figs. 4 and 5, in fixing portions for fixing between the props 3 and the upper plate 4 or between the props 3 and the floor plate 4_2, leak-leakage from the fixing portions can be prevented by arranging ring-shaped sealing members (such as O-ring O-rings) 23 around the fixing screws 20-for fixing, respectively, covering the fixing portions by cover portions 21, and fixing the cover portions 21 by screws 22.

10 According to achieving thus constitution With this arrangement, it is possible to assemble the vacuum chamber on a spot such as a factory. Furthermore, since thermal deformation of plates and props are prevented because heat in welding or soldering, etc. is not yielded on the spot, so that a grinding operation or a cleaning operation can be omitted on the spot.

15 A working mode as shown in Fig. 9 is such that housing spaces 73 for housing deformation of the top portions of the side surface sealing portions 81 are formed along both side lines of the installation grooves 71. Since housing spaces 73A and 73B are provided on the both sides of the housing spaces 73, the side surface sealing portions 81 are crushed into the housing spaces 73A and 20 73B equally to be housed, so that a further effect such that bias of the gasket 8 can be prevented is gained.

Moreover, as shown in Fig. 10, a vacuum chamber assembly 1 (1A) with the above-mentioned constitution is connected with the same vacuum chamber assembly 1B by removing one of the side plates 6, being disposing the 25 vacuum chamber assembly 1A adjacent to the vacuum chamber assembly 1B, and fixing them to each other to be able to gain an inner space 50A larger than

an inner space 50 in one vacuum chamber assembly. Besides, a frame with a
the same shape as the circumferential edge of an opening portion~~existed,~~
created by removing the side plate 6, is arranged between the vacuum chamber
assemblies 1A and 1B, it is preferred to connect both assemblies 1A and 1B via
5 the frame. Thus, since a plurality of vacuum chamber assemblies 1 can be
connected in series, the vacuum chamber assembly 1 is ~~very available in the~~
~~ease of adaptable upon~~ extension of equipment in future.

As ~~explaining the explained~~ above, according to this invention, it is easy
to transport parts to a working spot and it is possible to assemble it on the spot,
10 because the vacuum chamber assembly is ~~an assembly a system assembled~~ by
screws and so on. Furthermore, since a heating operation such as welding or
soldering which was carried out on the spot before is not carried out, additional
treatment to heat deformation etc. and/or cleaning operation can be omitted.
Due to ~~For~~ these reasons, it can be coped with enlarging of a device itself can be
15 coped with, simplifying of transport operation and simplifying of assembling
operation can be achieved, and further, reducing costs reduction can be
achieved.

Since the gasket which is formed unitedly of parts for sealing the side
surfaces and parts for sealing the connected portions are used, a sealing level in
20 the connected portions can be increased, and further, the sealing level in the
connected portions can be made sure according to reliable with the constitution
~~such as to cover in which the connected portions are covered.~~

Furthermore, the assembly can ~~extend be extended~~ easily without
decreasing the sealing level by constituting by an assembly system.

ABSTRACT OF DISCLOSURE

The object of the invention is to provide a vacuum chamber assembly which can be assembled on a spot such as a factory easily and extension of which is easy. Therefore, this invention is a A vacuum chamber assembly which constitutes a part of a device such as a sputtering device, comprising at least comprises a floor plate, an upper plate, a plurality of plural props standing on said the floor plate to support said the upper plate, and side plates for closing side opening portions between said props, characterized by that: first the props.

10 First connected portions between the floor plate and the props and second connected portions between the upper plate and the props are fixed by screw fixing means; side surfaces of the floor plate, the props and the upper plate which constitutes circumferential screws. Circumferential edge portions of the side opening portions are provided with installation grooves respectively; a

15 grooves, respectively. A gasket which is unitedly constituted of includes side surface sealing portions which is installed in the installation grooves formed on the circumferential edge portions of the side opening portions, respectively, and connection sealing portions for sealing the first connected portions and the second connected portions is provided; and the portions. The side plates are

20 fixed to the circumferential edge portions so as to close the side opening portions via the side surface sealing portions of the gasket, respectively.